1D photonic crystals on ridge waveguides: a tunable Fabry-Perot cavity and a mode matched high quality factor microcavity.

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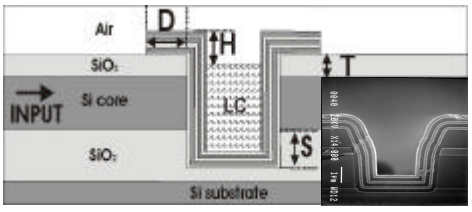
The integration of photonic crystals on waveguides has a very important role for future applications. The waveguide structure assures the confinement of the light along the transverse direction of the propagation, enabling a complete interaction of the propagating mode with the photonic structure. We show the experimental results and the theoretical analysis of two different devices composed by 1D photonic crystal on a monomodal ridge waveguide. The first device is realized on a SOI single mode ridge waveguide, where the photonic structure is composed by two symmetric DBR (SiO_2-Si stack layer), with a cavity between them, which is filled with liquid crystals. The tuning of the resonance peak transmission, around λ=1550nm, can be achieved applying an electric field between the two DBR. The second device has been realized on a Si_3N_4 single mode ridge waveguide where the photonic structure is formed by air slits removed from the waveguide. Varying the length of the first periods, the ones that face the waveguide and cavity, it is possible to decrease the insertion losses of the photonic device, thus increasing the quality factor of the cavity.



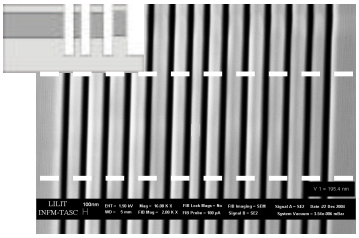
a)

b)

Figure1: a) schematic lateral view of the first device; the parameter S,T,D,H are adjusted to minimize the insertion losses of the device; the inset shows a SEM image of the realized device with the empty cavity. b) SEM image of the top view of the second device; the dashed white line shows the waveguide width. The inset shows a schema of the first three periods, highlighting the different period-length and filling fraction of the first one.